

Hypertension Trends in Outpatients at Kampala International University Teaching Hospital Ishaka

Ayella Edward

Faculty of Clinical Medicine and Dentistry Kampala International University Western Campus Uganda

ABSTRACT

This study aimed to identify trends in hypertension among patients at Kampala International University Teaching Hospital (KIU-TH) Ishaka. A descriptive cross-sectional design was used, with 327 outpatient clients enrolled. Hypertension was defined as the presence of one or more conditions, such as mean SBP ≥ 140 mmHg, mean DBP ≥ 90 mmHg, or the participant reports taking medication for hypertension. Data was coded and entered into SPSS version 22.0 for analysis. Univariate and multivariate logistic regression analyses were computed to determine factors associated with hypertension. Variables with a p-value of < 0.2 during univariate analysis were incorporated into a multivariate logistic regression model to control for confounding. AOR with a corresponding 95% confidence interval (CI) was computed to assess the strength of the association. The study found that alcohol consumption, cigarette smoking, consumption of branded herbal products, a BMI above 25 kg/m², and age above 44 years were significantly associated with hypertension.

Keywords: Hypertension, Non-communicable diseases, cardiovascular diseases, High Blood Pressure.

INTRODUCTION

Non-communicable diseases (NCDs) are currently responsible for 56 percent of all deaths and 46 percent of the disease burden measured in disability-adjusted life years (DALYs) in low- and middle-income countries [1, 2]. From a projected total of 58 million deaths from all causes in 2005, it was estimated that non-communicable diseases accounted for 35 million, which is double the number of deaths from all communicable diseases (including HIV/AIDS, tuberculosis, and malaria), maternal and perinatal conditions, and nutritional deficiencies combined. Non-communicable diseases (NCDs) are currently accounting globally for 70% of all deaths [3-5]. Most of these deaths (17.7 million) are due to cardiovascular diseases, such as myocardial infarction and stroke. Hypertension is one of the most potent risk factors for cardiovascular disease (CVD), affecting over 1 billion people worldwide [2, 3].

Once regarded as a problem only in high-

income countries, hypertension is currently a global problem increasing the risk for cardiovascular diseases (CVD) in both wealthy and poor nations [6-8]. It is estimated that 1 billion people are living with hypertension, and there are 9.4 million hypertension-related annual deaths worldwide. Low- and Middle-Income Countries (LMIC) suffer two-thirds of the global burden of cardiovascular diseases (CVD), which is associated with inadequate treatment of hypertension [9-11]. While in Africa, hypertension was considered non-existent early in the twentieth century, sub-Saharan Africa (SSA) has the highest prevalence in the world today, reaching approximately 30%, as reported in a recent systematic review and meta-analysis [12, 13]. A number of studies indicate that hypertension in sub-Saharan Africa (SSA) is a widespread problem. In some communities, it has been reported to be as high as 38%. It is estimated that out of the approximately 650 million people in SSA,

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about 10 to 20 million may have hypertension. Even though many countries in SSA still lack detailed basic data on the prevalence of hypertension [14].

Hypertension is among the leading contributors to the global burden of disease and premature death, accounting for approximately 9.4 million deaths annually [14]. The effects of hypertension, if not controlled, are devastating and may lead to a number of complications, including stroke, myocardial infarction, cardiac failure, and renal failure, among others [14]. Some studies have highlighted hypertension as the leading contributor to the global burden of disease (GBD). In the GBD Study of 2015, it accounted for more than 212 million global disability-adjusted life years (DALYs), reflecting a 40% increase from 1990. In sub-Saharan Africa, the corresponding change in DALYs attributable to hypertension ranged from 60% to 100%. Furthermore, with the increasing prevalence of hypertension in many sub-Saharan African countries, experts have projected a major increase in the burden of disease attributable to hypertension in this setting [15, 16].

Besides hypertension being a major contributor to NCD burden in both developed and developing countries, it is a primary cause of hemorrhagic and atherothrombotic stroke, hypertensive heart disease, hypertensive kidney failure, and coronary artery disease [7]. The economic impact of hypertension in Africa is felt directly by individuals and the healthcare system through the high costs incurred in managing complications, and indirectly through the loss of household incomes due to disability and death of affected individuals [15].

To this end, in view of the above, this research was aimed at creating awareness about hypertension control and complications for uninformed patients, providing literature for other researchers, and collecting data that will be essential for the equitable allocation of resources to the outpatient department at Kampala

International University Teaching Hospital, Ishaka. A cross-sectional study design was used in this research.

Once regarded as a problem only in high-income countries, hypertension is currently a global problem increasing the risk for cardiovascular diseases (CVD) in both wealthy and poor nations[17]. Today, low- and Middle-Income Countries (LMIC) suffer two-thirds of the global burden of cardiovascular disease (CVD), which is associated with inadequate control of hypertension [3, 18]. Hypertension is among the leading contributors to the global burden of disease and premature death, accounting for approximately 9.4 million deaths annually [14].

Behavioral risk factors such as salt intake, alcohol consumption, smoking, and physical inactivity due to changes in lifestyle and sociodemographic factors such as the place of residence, educational level, economic status, and marital status; and metabolic factors such as diabetes, obesity, and dyslipidemia are some of the factors that have been implicated in the increased prevalence of hypertension [19]. It is estimated that one billion people are living with hypertension[20]. A number of studies indicate that hypertension in sub-Saharan Africa (SSA) is a widespread problem, and in some communities, it has been reported to be as high as 38%. It is estimated that out of the approximately 650 million people in SSA, between 10 to 20 million may have hypertension. Many countries in SSA still lack detailed basic data on the prevalence of hypertension [14]. Uganda still lacks comprehensive data on the prevalence of hypertension; however, the prevalence of hypertension in Uganda is estimated to be ranging from 11% to 32%[16]. Data about the prevalence of hypertension at KIU-TH is still lacking. This study will seek to establish the prevalence trends and risk factors associated with hypertension among patients attending the outpatient department of Kampala International University Teaching Hospital.

METHODOLOGY

Study Design

The research adopted a cross-sectional

descriptive study employing quantitative data collection methods. This helped to

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analyze the problem in question since it involved the use of numbers and situations to explain the occurrence of the problem.

Area of Study

The study was carried out at Kampala International University Teaching Hospital, located along Mbarara-Kasese road, in Bushenyi-Ishaka Municipality of Southwestern Uganda. Kampala International University Teaching Hospital is a private hospital in partnership with the Government of Uganda for a program that runs a free treatment policy. The hospital's location is approximately 360 kilometers (220 miles) southwest of Kampala, the largest city in the country. The coordinates of the hospital are: 0° 32' 29.04"S, 30° 8' 25.80"E (Latitude: 0.5414; Longitude: 30.1405). The hospital has a private and a public wing with a total bed capacity of about 1000. The five major disciplines present are Internal Medicine, Obstetrics/Gynecology, Surgery, Psychiatry, and Pediatrics. There is a total of 250 beds. On a daily basis, the hospital attends to over 100 in-patients and 150 out-patients. The hospital serves a population of about 2 million people, and patients also come from neighboring countries, e.g., Kigali, Rwanda. It has special clinics, for example, Mother Child Health, Mental Health Clinic (MHC), Ophthalmology, Dental, Ear, Nose and Throat (ENT), Radiology, and Dermatology, which operate throughout the week.

Study Population

Patients who attended outpatient departments at KIU-TH aged above 15 years.

Inclusion Criteria

- Patients who attended the outpatient department at KIU-TH aged above years.
- Patients who consented to the study.

Exclusion Criteria

- Patients who were below the age of 15 years.
- Patients who did not consent to participate in the study.

Sample Size Determination

The sample size was calculated using the probability sampling formula below, as per Fischer et al.[21]

$$N = Z^2 pq / d^2$$

Where,

- n = sample size, when the population size is greater than 10,000.

- Z = Standard normal deviation, i.e., 1.96, set at a 95% confidence level.

- p = proportion of people with hypertension.

- q = 1 - p = expected non-prevalence

- d = Desired degree of accuracy

If the value of p = 26.3% (Guwatudde et al., 2015), p = 0.263

$$n = Z^2 * p * (1 - p) / d^2$$

$$= 1.962 * 0.263 * (1 - 0.263) / 0.052$$

$$= 298$$

A 10% increment was included to cater for non-response, thus arriving at the final sample size of 327 subjects.

Sampling Procedures

Consecutive sampling technique was used to sample the study participants, and patients who met the inclusion criteria were enrolled in the study as they came in.

Data Collection Methods and Management

Primary data was obtained using a structured questionnaire administered in English and Runyankore languages. The investigator introduced himself to the prospective participants and read to each participant the consent form, the title, and the purpose of the study, as well as the rights of the participants throughout the study. Participants who consented to participate in the study were given questionnaires to fill out on their own so that they could answer the questions privately and feel secure in terms of confidentiality. The investigator assigned special numbers to all the questionnaires. This was done to ensure data quality as the data was entered into the coding box.

Measurement of Blood Pressure

Blood pressure was measured using a sphygmomanometer (Littman's classic type II) according to the following standardized procedure: participants were seated upright in a chair, with feet resting firmly on the floor and not crossed. To ensure that the antecubital fossa was at the level of the heart, participants were seated with the left arm resting on a desk or armrest. The cuff was placed on the arm about 2-3 cm above the antecubital fossa and not restricted by clothing. The participants were allowed to relax for 3-5 minutes

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before blood pressure was measured. Three measurements were taken at two-minute intervals. During this period, participants were to remain quiet and still. The mean of the last two measurements was used to calculate the final systolic blood pressure (SBP) and diastolic blood pressure (DBP).

Diagnosis of Hypertension

Blood pressure measurements were classified according to the JNC7 guidelines of the Joint National Committee of Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension is defined as the presence of one or more of the following conditions: mean SBP ≥ 140 mm Hg, mean DBP ≥ 90 mm Hg, or the participant reports that he/she is currently taking medication for hypertension.

- Pre-hypertension is defined as systolic blood pressure between 120 and 139 mm Hg and/or diastolic between 80 and 89 mm Hg.

- Hypertension, which is defined as systolic blood pressure greater than 140 mm Hg and/or diastolic blood pressure greater than 90 mm Hg or treatment with antihypertensive medication.

- Severity of hypertension using categories defined by the United States Seventh Joint National Committee on Detection, Evaluation, and Treatment of Hypertension (JNC-VII).

- Awareness status is defined as participants having been told by a health worker that they had hypertension.

- Treatment status is defined as any prescribed treatment for high blood pressure, including diet, exercise, weight loss, smoking cessation, and pharmacological therapy.

- Blood pressure control is defined as treatment to a target systolic blood pressure of less than 140 mm Hg and diastolic less than 90 mm Hg.

Height was measured to the nearest 0.1 cm with an SECA 214 portable stadiometer

Prevalence of Hypertension among patients attending outpatient department of KIU-TH.

The overall prevalence of hypertension among patients attending the outpatient department of KIU-TH was recorded at

while the subjects stood barefoot in the center of the base with their back to the stadiometer. Weight was measured to the nearest 0.1 kg with a SECA 762 scale. These recordings were used to derive the body-mass index.

Data Analysis

Questionnaire tools were checked for accuracy and data completeness, then data was coded and entered into Epi Info version 7, and subsequently exported into SPSS version 22.0 for analysis. A binary logistic regression model was used to identify the determinant factors. A collinearity diagnostic test was conducted using tolerance to check for collinearity between independent variables and interaction effect. Variables in the bivariable analysis having a p-value < 0.2 were considered for multivariate analysis to adjust for confounders. The strength and presence of statistical association were assessed by OR, p-value, and 95% confidence interval (95% CI). Variables with a p-value ≤ 0.05 were considered statistically significant determinant factors of teenage pregnancy. The Hosmer-Lemeshow goodness-of-fit test ($p = 0.9289$) was used to assess the fitness of the model.

Quality Control

To ensure quality work, the inclusion and exclusion criteria were strictly adhered to, and data forms were double-checked for completeness by the principal investigator.

Ethical Considerations

The permission to conduct this study was obtained from the Office of the Dean of the Faculty of Clinical Medicine and Dentistry at KIU, Western Campus. Participants to be enrolled were requested to sign consent after a thorough explanation of the purpose of the study, the risks involved, and the use of data to be collected. Numbers, instead of names, were used in all the questionnaires to ensure confidentiality.

RESULTS

15.6% with 51 patients above hypertension threshold values of systole and diastole pressure values with a mean systolic blood pressure of 120.84 mmHg (95% CI: 119.12 - 122.08) and mean diastolic blood pressure of 79.80 mmHg (95% CI: 79.15-80.82). By

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stage classification, 8% of the patients had stage I hypertension, 6.1% had stage II hypertension and 1.5% had stage III which is

the severe level as shown in Table 3, Figure 1 and Figure 2

Table 1: Status of hypertension among patients attending- the patient department of KIU - TH

Variable	Women (n=167)		Men (n=160)	
	n	(%)	n	(%)
Systolic blood pressure, mmHg				
< 90	1	0.6	0	0
90-139	143	85.6	142	88.7
≥140	23	13.6	18	11.3
Mean	120.84			
≥Median	120			
Diastolic blood pressure, mmHg				
< 60	0	0	0	0
60-89	151	90.3	140	87.4
≥90	16	9.7	20	12.6
Mean	79.80			
≥Median	80			
Prevalence of hypertension				
Total	22	13.2	29	18.1
Stage of hypertension				
Stage I	10	6.0	16	10
Stage II	9	5.4	11	6.9
Stage III (severe)	3	1.8	2	1.3

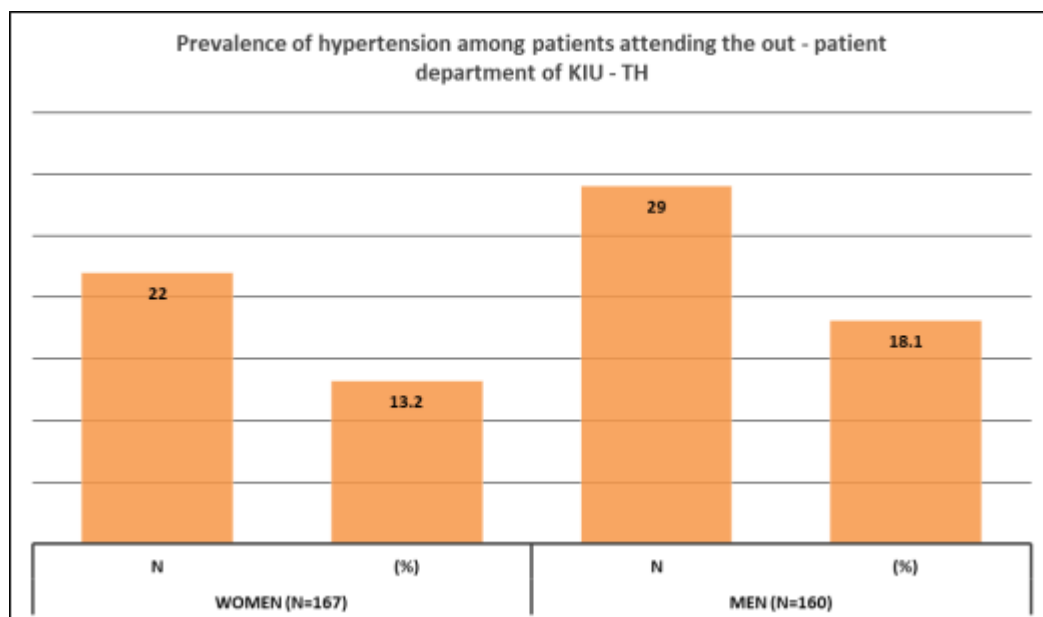


Figure 1: Column bar graph showing the prevalence of hypertension among outpatients at KIU - TH

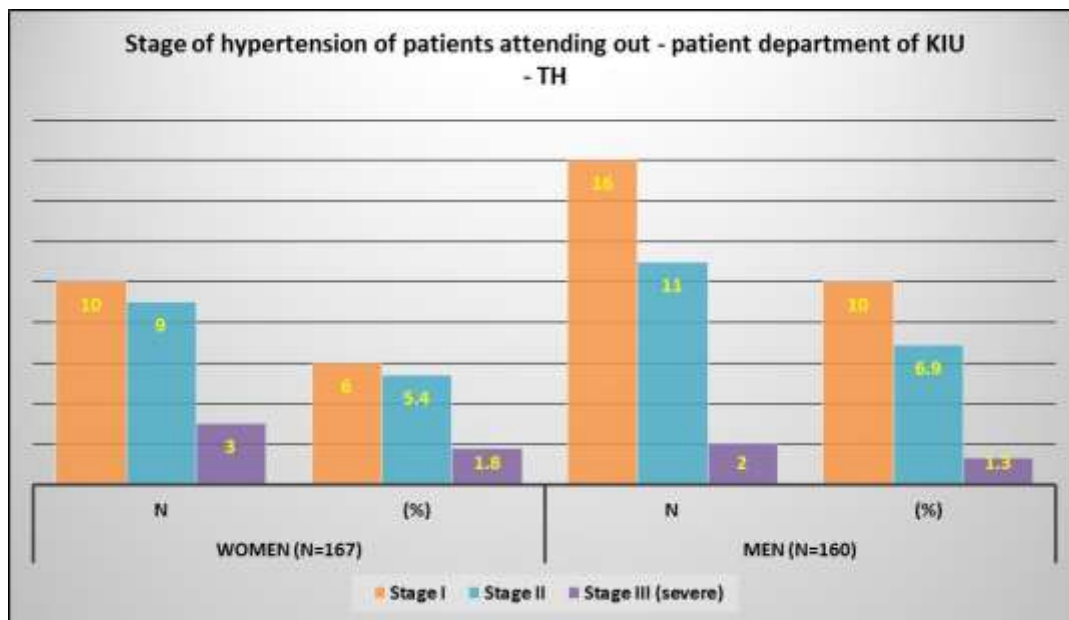


Figure 2: Column bar graph showing hypertension stages of hypertensive out patients at KIU -TH

Socio-demographic characteristics of patients attending the outpatient department in KIU-TH.

The majority of the patients attending the outpatient department of KIU - TH studied were female 167(51.1%), with a mean age of 41.20 ± 1.6 years mostly in the category of 35 - 44 years 148 (45.3%), residing in a rural setting 251 (76.8%), married 213 (65.1%), had attained a primary level education 108 (33.0%), majority earning a living through casual labour 77 (23.5%), and an average monthly income less than 100,000/- per month 124 (37.9%) as shown in Table 1.

Anthropometric Values and Behavioral Characteristics of patients attending outpatient department of KIU-TH

Mean value of weight, height, and body mass index of the study participants was

59.03 kg (95%CI: 56.86-64.18), 1.53 meters (95% CI: 1.514 - 1.563), and 23.25 kg/m^2 (95% CI: 23.02 - 24.05), respectively. A quarter of the patients smoked cigarettes and all were men 83 (25.4%) of which 46 (55.4%) of these smoked more than one stick per day, 134 patients accounting for 41% consumed alcohol of which 95 (70.8%) consumed more than a bottle per day, more than half of the patients consumed branded herbs that are sold on the market 182 (55.7%) of which 102 (56%) of these consumed more than bottle of the products per day. Only 43 (13.1%) of the patients reported practicing regular exercise and 28 accounting for 8.6% reported practicing regular jogging exercise as shown in Table 2.

Table 2: Socio-demographic characteristics of patients attending the outpatient department of KIU - TH

Characteristic	Frequency (N=327)	Women (n=167)		Men (n=160)	
		n	(%)	n	(%)
Place of residence					
Rural	251	139	41.7	112	33.6
Urban	76	28	8.4	48	14.4
Age, year					
≤24	36	17	3.9	19	6.9
25-34	81	47	14.1	34	10.2
35-44	148	71	21.3	77	21.3
45-54	31	18	5.4	13	3.9
≥55	31	13	3.3	18	3
Mean age	41.20				
Religion					
Protestant	107	58	17.4	49	14.7
Catholic	128	67	20.1	61	18.3
Muslim	59	29	8.7	30	9
Others	33	13	3.9	20	6
Marital status					
			0.3		0.3
Single	93	66	19.8	27	8.1
Married	213	82	24.6	131	39.3
Others	21	19	5.7	2	0.6
Educational status					
No formal education	41	32	9.6	9	2.7
Primary	108	53	15.9	55	16.5
Secondary	97	49	14.7	48	14.4
Tertiary	81	33	9.9	48	14.4
Occupational status					
No formal employment	64	48	14.4	16	4.8
Casual laborer	77	32	9.6	45	13.5
Peasant farmer	73	57	17.1	16	4.8
Business	58	12	3.6	46	13.8
Salaried employment	36	7	2.1	29	8.7
Student	19	11	3.3	18	5.4
Monthly income, Shs					
No income	83	79	23.7	4	1.2
<100,000	124	60	18	64	19.2
101,000 - 200,000	59	17	5.1	42	12.6
>200,000	61	11	3.3	50	15

Table 3: Anthropometric Values and Behavioral Characteristics of patients attending out-patient department of KIU - TH

Variable	Frequency (N=327)	Women (n=167)		Men (n=160)	
		n	(%)	n	(%)
Weight, kg					
≤54	64	46	13.8	18	5.4
55-64	151	59	17.7	92	27.6
≥65	112	62	18.6	50	15
Mean	59.03				
≥Median	57				
Height in meters					
≤1.54	204	127	38.1	77	23.1
1.5-1.64	95	32	9.6	63	18.9
≤1.65	28	8	2.4	20	6
Mean	1.53				
≥Median	1.58				
Body mass index, kg/m ²					
<18.5	69	26	7.8	43	12.9
18.5 - 25	190	82	24.6	108	32.4
≥25	68	19	5.7	49	14.7
Mean	23.27				
Median	23.30				
Cigarette smoking					
Yes	83	0	0	83	24.9
No	244	167	50.1	77	23.1
Amount of smoking					
			0.3		0.3
<1 stick per day	25	0	0	25	7.5
Only 1 stick per day	12	0	0	12	3.6
> 1 stick per day	46	0	0	46	13.8
Alcohol drinking					
≥Yes	134	31	9.3	103	30.9
No	193	136	40.8	57	17.1
Amount of alcohol drinking					
<1 drink per day	22	11	3.3	11	3.3
Only 1 drink per day	17	15	4.5	2	0.6
>1 drink per day	95	5	1.5	90	27
Drinking branded herbs					
>Yes	182	73	21.9	109	32.7
No	145	94	28.2	51	15.3
Amount of branded herbs					
<1 drink per day	16	12	3.6	4	1.2
Only 1 drink per day	64	55	16.5	9	2.7
>1 drink per day	102	6	1.8	96	28.8
Practicing regular exercise					
≥Yes	43	14	4.2	29	8.7
No	284	153	45.9	131	39.3
Jogging as a regular exercise					
Yes	28	4	1.2	24	7.2
No	299	164	49.2	136	40.8

Risk factors associated with hypertension among patients attending the outpatient department of KIU - TH.

In bivariate analysis, alcohol consumption (p = 0.001), cigarette smoking (p = 0.001),

consumption of branded herbal products on the market (p = 0.001), a BMI above 25 kg/m² (p = 0.001) and being aged above 44 years (p = 0.001). Patients who consumed alcohol consumers were 31.60

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times at an increased risk of hypertension than non-consumers, Cigarette smokers had an increased hypertension risk of 86.40 times compared to nonsmokers, whereas patients who consumed branded herbal products sold on the market had 43.57 times increased risk of ending up hypertensive than the non-consumers, while patients with a BMI body mass index above 25 kg/m² had 1.614 times increased risk of ending up hypertensive than those below that, and those aged above 44 years were 1.050 times more likely to end up hypertensive. In a multivariate model analysis when all variables were controlled for any confounding factors, alcohol consumers were 11.216 times more likely to be hypertensive as compared to non-alcohol consumers [AOR = 11.216, 95% CI: (3.509 - 31.334), p =

0.001]. Cigarette smokers were 17.295 times more likely to be hypertensive as compared to non-cigarette smokers [AOR = 17.295, 95% CI: (4.680 - 52.006), p = 0.001]. Consumers of branded herbal products sold on the market were 8.656 times more likely to be hypertensive as compared to those who didn't consume those products [AOR = 8.656, 95% CI: (1.755 - 20.604), p = 0.005]. Patients with a BMI above 25 kg/m² had 1.328 times increased risk of ending up hypertensive than those below [AOR = 1.328, 95% CI: (1.180 - 1.650), p = 0.001] and those aged above 44 years were 1.272 times more likely to end up hypertensive than patients younger than that [AOR = 1.272, 95% CI: (1.001 - 1.302), p = 0.022] as shown in Table 4.

Table 4: Bivariate and multivariate analyses of factors associated with hypertension among patients attending the outpatient department at KIU - TH

Variable	β	SE	P	OR	95% CI for AOR		
			Crude	Adjusted	COR	AOR	LowerUpper
Alcohol drinking							
Yes	2.460	0.608	0.001	0.001	31.60	11.216	3.50931.334
No (reference)							
Cigarette smoking							
Yes	2.828	0.635	0.001	0.001	86.40	17.295	4.68052.006
No (reference)							
Drinking branded herbs							
Yes	1.956	0.696	0.001	0.005	40.80	8.656	1.75520.604
No (reference)							
BMI (kg/m2)							
>25	0.269	0.074	0.001	0.001	1.614	1.328	1.1801.650
<18.5 (reference)							
Age							
>44 years	0.038	0.018	0.001	0.022	1.050	1.272	1.0011.302
<35 years (reference)							

DISCUSSION

Prevalence of Hypertension among Patients Attending the Outpatient Department at Kampala International University Teaching Hospital

The overall prevalence of hypertension among patients attending the outpatient department of KIU-TH is 15.6%. This finding is consistent with other studies in Rwanda and Ethiopia [22, 23]. This similarity in findings across all these studies can be attributed to the similarity of the populations in Uganda, Rwanda, and Ethiopia, including their lifestyles. By stage classification, 8% of the patients had stage I hypertension, 6.1% had stage II hypertension, and 1.5% had stage III, which is the severe level. The majority of the study participants in this study were aged above 40 years. Additionally, the conclusions from this study suggest that age 40 and above increase the risk of hypertension. While this study did not investigate the causative reasons for seeking outpatient health services, the observation of the majority of patients in that age group being significantly associated with the condition is consistent with the most recent empirical trends in reporting non-communicable diseases [24]

Demographic Trends in Hypertension among Patients Attending the Outpatient Department at Kampala International University Teaching Hospital

A total of 327 patients attending the outpatient department of KIU-TH aged 15 years and above were recruited in this study. The majority of them were female (51.1%), with a mean age of 41.20 ± 1.6 years, mostly aged between 35 - 44 years (45.3%). Furthermore, 76.8% of the patients resided in a rural setting, were married (65.1%), had attained primary level education (33.0%), the majority earned a living through casual labor (23.5%), and had an average monthly income of less than 100,000/- per month (37.9%). The socio-demographic pattern observed in this study is consistent with

similar studies on the same subject conducted in Uganda, Nepal, Zambia, Zanzibar, and Malaysia, where the population by strata was mainly female, resided in rural areas, had basic literacy skills through primary education, and earned less than USD 30 (equivalent to less than 100,000/-) on average per month [16, 25-28]. However, despite this striking consistency, these studies were community-based studies, unlike findings derived from a Teaching Hospital-based study like this one. The consistency in socio-demographic patterns of those studies and this particular one can be attributed to the convergence on account of similar population stratification in those study areas of Nepal, Zanzibar, and Zambia, as alluded to by the most recent Uganda Demographic and Health Survey of 2016 [29, 30]

Factors Associated with Hypertension among Patients Attending the Outpatient Department at Kampala International University Teaching Hospital

Hypertension is one of the leading classified non-communicable diseases [6, 8], and its association with lifestyle behavior has been extensively studied and reported on [31]. Based on behavioral characteristics, the majority of the study participants attending the outpatient department of KIU-TH, slightly over a quarter smoked cigarettes, and all were men (25.4%), of which 55.4% smoked more than one stick per day. This finding is consistent with a study in Botswana where more than a quarter of the study population were habitual smokers, and more than half of those smoked more than a stick a day [32]. However, in first-world countries where hypertension is even more prevalent, habitual smoking has been recorded in even higher percentages, above 70% of the population, and its association with an increased risk of hypertension. Thus, studies in the United States and Europe paint a completely different picture of higher

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rates of the habit and its association with the condition [31].

The study has established that forty-one percent of the outpatients at KIU-TH consume alcohol, and of these, 70.8% consumed more than a bottle per day. Even in a multivariate model when all confounders were controlled, alcohol consumption increased the hypertension risk by 11.216 times for alcohol consumers compared to non-consumers. This finding is corroborated by similar findings in Ethiopia and Peru where nearly half of the study populations were alcohol consumers and consuming more than a liter per day [33]. The significant association of alcohol consumption with an increased risk of hypertension can empirically be associated with alcohol's ability to cause central nervous system imbalance, which can lead to the initiation of hypertension [34]. Such CNS imbalances like baroreflex impairment, sympathetic outflow, and renin-angiotensin system initiation cause the expansion of extracellular fluid (elevation of plasma vasopressin and renin activities), which in turn alters the extracellular calcium position to the intracellular space by increasing sensitivity to vasoconstrictor nor-epinephrine. All these physiological predispositions lead to vasoconstriction and cause hypertension [34].

Based on the recent flooding on the market of unempirically verified branded herbs, some of which have already been reported to be laced with potent drugs like sildenafil [35], this study has been able to establish that more than half (55.7%) of the outpatients at KIU-TH consumed branded herbs that are sold on the market. Furthermore, 56% of these consumed more than a bottle of the products per day. In a very recent study in Uganda, Kilama et al. [36] expounded on the significant effect of such products on the market, and they corroborate the same finding of this study that such products are increasing the risk of non-communicable diseases, of which

hypertension is one of the classified ones. This study has been able to establish that only 13.1% of the outpatients at KIU-TH practiced regular exercise, and only 8.6% practiced regular jogging exercise. However, the overwhelming benefits of regular physical exercise like jogging, running, cycling, and swimming have been well emphasized by previous studies [37–39].

In a multivariate model analysis, when all variables were controlled for any confounding factors, alcohol consumers were 11.216 times more likely to be hypertensive compared to non-alcohol consumers [$p = 0.001$]. Cigarette smokers were 17.295 times more likely to be hypertensive compared to non-cigarette smokers [$p = 0.001$]. Consumers of branded herbal products sold on the market were 8.656 times more likely to be hypertensive compared to those who didn't consume those products [$p = 0.005$]. Patients with a BMI above 25 kg/m² had a 1.328 times increased risk of developing hypertension compared to those below [$p = 0.001$], and those aged above 44 years were 1.272 times more likely to develop hypertension than patients younger than that [$p = 0.022$].

In an attempt to advance a predictive model of the trend of non-communicable diseases, to which hypertension belongs, the prediction model of Wang and colleagues [40] closely aligns with the findings of this study. However, even though the prediction trend model of Wang et al [40] highlights the burden of alcohol consumption, cigarette smoking, non-proportional BMI, and the lack of appreciation of physical exercise as protective factors against hypertension, this study seems to discover a new potential causative factor of hypertension among KIU-TH outpatients, which is the consumption of branded herbal products on the market.

Recommendations

This study uncovers a new trend and a potential predictor of hypertension in rural settings, which is the consumption

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of branded herbal products on the market. Therefore, we recommend a comprehensive cohort design study with

a focus on the consumption of branded herbal products in relation to hypertension.

CONCLUSION

Among the patients seeking health services from the outpatient department of KIU-TH, 15.6% of them are hypertensive across three classifications of hypertension, with 8% having stage I hypertension, 6.1% having stage II hypertension, and 1.5% having stage III, which is the severe level. Alcohol

consumption [p = 0.001], cigarette smoking [p = 0.001], consumption of branded herbal products sold on the market [p = 0.005], a BMI above 25 kg/m² [p = 0.001], and age above 44 years [p = 0.022] are predictors of hypertension among patients attending the outpatient department of KIU-TH.

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